

Design Consultants, Inc.
Consulting Engineers & Land Surveyors



Main Office:
120 MIDDLESEX AVE. STE 20
SOMERVILLE, MA 02145
Tel: 617-776-3350

North Shore Office:
68 PLEASANT STREET
NEWBURYPORT, MA 01950
Tel: 978-358-7173

STORMWATER MANAGEMENT REPORT
FOR
PROPOSED MIXED USE DEVELOPMENT
176 & 182 BROADWAY
SOMERVILLE, MA

Prepared for:
Yihe Real Estate Holdings Limited
c/o Richard G. DiGirolamo, Esq.
424 Broadway, Somerville, MA 02145

Prepared by:
Design Consultants, Inc.
120 Middlesex Avenue, Suite 20
Somerville, Massachusetts 02145-1104

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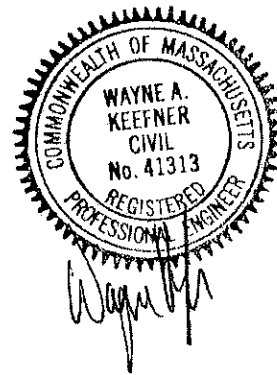


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INTRODUCTION

Yihe Real Estate Holdings Limited proposes the development of the property at 176 & 182 Broadway in Somerville, MA. The site is zoned Central Business District (CBD). The existing parcels cover 11,819 square feet (0.27 acres). There is currently a three-story, wood framed building and a one-story concrete building on the subject site operating as a residential building and bakery, respectively. The remainder of the site is primarily paved with asphalt in fair condition.

EXISTING CONDITION

The runoff from the lot is one drainage area (subcatchment). (See Appendix C, *Figure 1*) The site is 100% impervious and slopes gently from the rear yard to the street. The wood framed building has downspouts that discharge to paved surfaces. The concrete block building has an internal roof drain that discharges to the sewer in Broadway. The paved areas in the rear of the buildings sheetflow through a driveway and alleyway to catch basins in Broadway that connect to the storm sewer. Aside from minor onsite infiltration through broken pavement, the entire site drains offsite without mitigation.

According to FEMA Flood Insurance Rate Map Number 25017C0439E, with an effective date of June 4, 2010, the site is not located in a flood zone. (See Appendix A).

SOILS

The NRCS Web Soil Survey characterizes the soil at the site as entirely Urban Land and does not specify a Hydrologic Soil Group. (See Appendix B)

For calculation purposes, a Hydrologic Soils Group of C was used for all subsurface soils. Per the Massachusetts Stormwater Handbook, Table 2.3.3 1982 Rawls Rates, an infiltration rate of 0.17 in/hr has been used in the hydrologic model. A planned soil test will determine the groundwater elevation. The proposed storage and infiltration fields, described below, have been designed for minimal cover. If necessary, shallower storage chambers can be substituted to provide better separation to groundwater.

PROPOSED CONDITION

The proposed development includes the demolition of the existing buildings to accommodate a five-story building with ground level retail space and 19 residential units above. Parking is provided at grade and in the basement level of the building. The site is accessed by modifying an existing curb cut. A landscape area is proposed in the very rear of the site, adding approximately 1,000 square feet of pervious area.

The catchments in the proposed condition are very similar to the catchments in the existing condition. (See Appendix D, *Figure 2*)

Drainage:

Drainage calculations were conducted to evaluate peak discharges from the project site under the pre-development and post-development conditions (See Appendix E). As required under the City of Somerville's Stormwater Management Policy, peak discharges under post development conditions will be less than the pre-development conditions.

The proposed stormwater management system includes roof drains and an infiltration trench for detention and groundwater recharge of roof runoff that is collected internally and piped to the infiltration chambers. An overflow for the roof drains is provided inside the building and discharges to an existing connection in Broadway. The ramp down to the garage level is half covered by structure above. The uncovered half will be heated and runoff is collected by a trench drain located at the garage door. The trench drain will discharge to the existing connection in Broadway. The landscape area in the rear will drain to a depressed area provided between the proposed building and the rear property line. The access drive will continue to flow, uncollected, to Broadway, as it does in the existing condition. The building's basement footprint does not provide space within the subject property for installation of a drainage structure to capture this runoff.

4:1 Infiltration/Inflow Removal:

The 4:1 I-I requirement stipulates that for every increased gallon of sewage flow per day, four gallons of stormwater are stored and infiltrated onsite. The volume of stormwater represents the required amount to be stored/infiltrated per year. Calculations for the 4:1 I-I requirement are provided as Appendix G of this report.

HYDROLOGIC MODEL

The hydrologic model used for this analysis is based upon the SCS Method. Both existing and proposed conditions are modeled for the 2-year, 10-year, 25-year, and 100-year storm events. The SCS Method allows for variable rainfall intensity throughout the storm duration, peaking near the middle of the Type III, 24-hour storm. The drainage area's time of concentration (t_c), assumed to be six minutes for this site.

The designed on-site stormwater management system collects and infiltrates site runoff reducing off-site flows for all storm events.

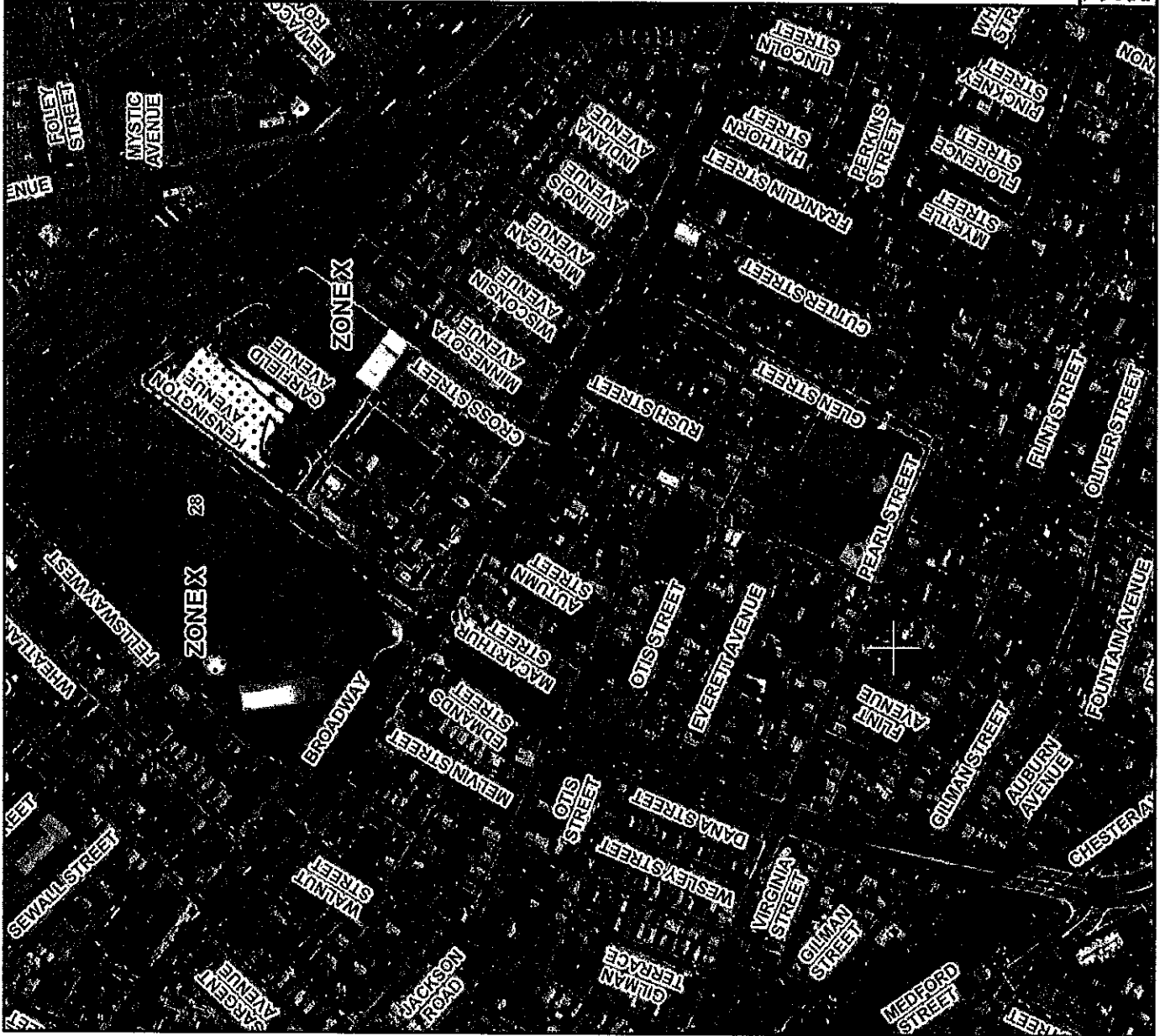
Table 1

2 Year (3.10")	Pre	0.54	2,825
	Post	0.43	1,889
10 Year (4.50")	Pre	0.80	4,200
	Post	0.68	3,190
25 Year (5.30")	Pre	0.94	4,986
	Post	0.82	3,948
100 Year (6.50")	Pre	1.15	6,167
	Post	1.04	5,096

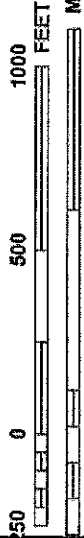
CONCLUSION

Based on DCI's analysis of the existing and proposed conditions, the proposed site condition meets the criteria set forth by the City of Somerville. Off-site runoff volume and peak flow rate for the 2, 10, 25 and 100-year storm events is decreased. If an illicit stormwater connection to the sanitary sewer is found, it will be eliminated and a new connection will be made to the appropriate storm sewer. The 4:1 I/I requirement will be met. DCI concludes that the proposed development at 176 & 182 Broadway, Somerville, MA adheres to all applicable stormwater management policies.

Appendix A



MAP SCALE 1" = 500'



NFIP

PANEL 0439E

FIRM

FLOOD INSURANCE RATE MAP

MIDDLESEX COUNTY,
MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 439 OF 656
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

NUMBER	PANEL	SUFFIX
250182	0439	E
250205	0439	E
250214	0439	E

COMMUNITY:
EVERETT, CITY OF
NEEDHAM, CITY OF
SOMERVILLE, CITY OF

NOTICE TO USER: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
25017C0439E

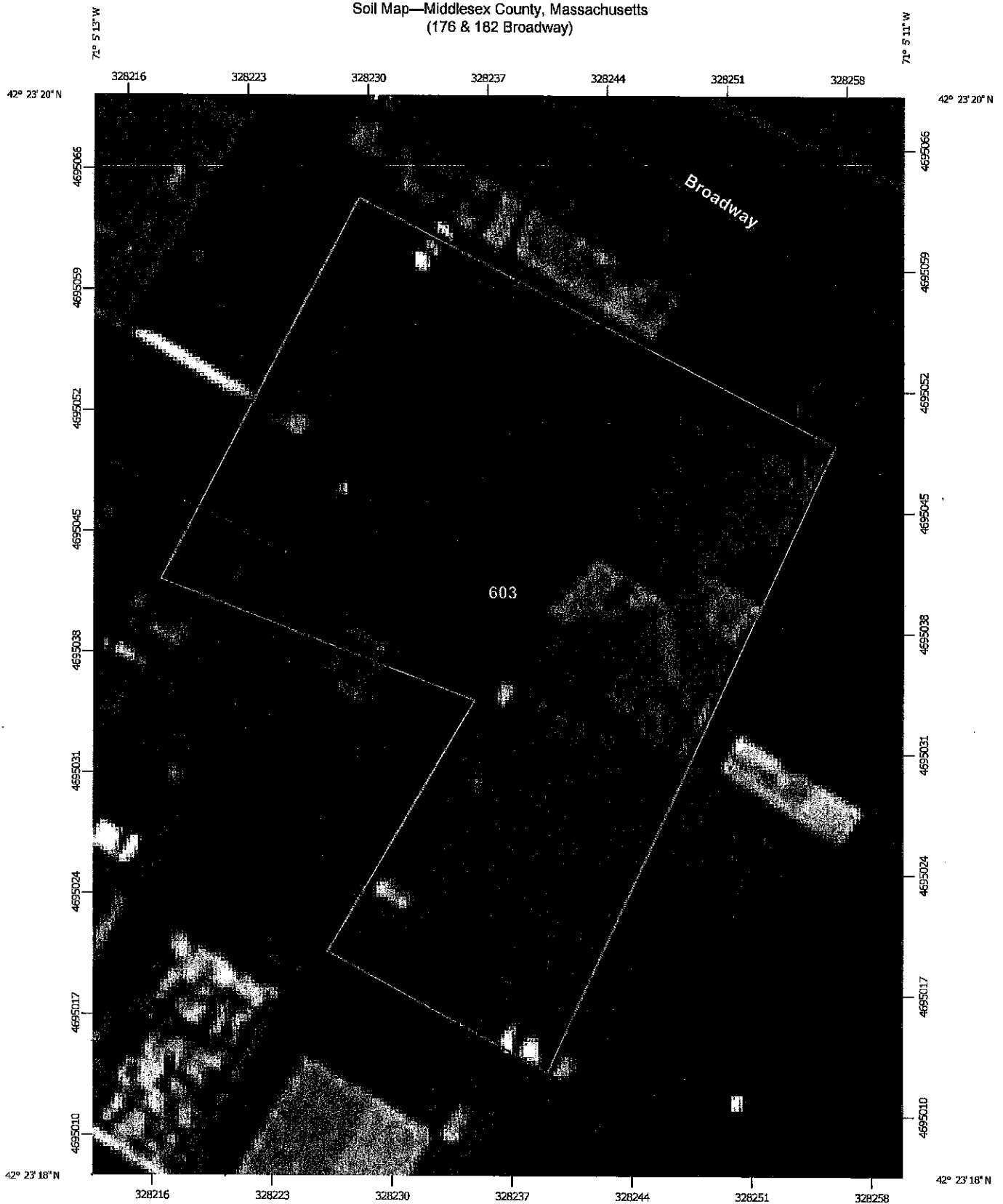
EFFECTIVE DATE
JUNE 4, 2010

Federal Emergency Management Agency

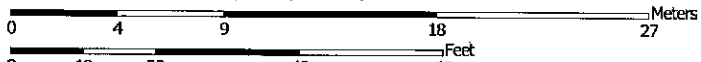
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Appendix B

Soil Map—Middlesex County, Massachusetts
(176 & 182 Broadway)



Map Scale: 1:305 If printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

8/9/2013
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)	
	Area of Interest (AOI)
Soils	
	Soil Map Unit Polygons
	Soil Map Unit Lines
	Soil Map Unit Points
Special Point Features	
	Blowout
	Borrow Pit
	Clay Spot
	Closed Depression
	Gravel Pit
	Gravelly Spot
	Landfill
	Lava Flow
	Marsh or swamp
	Mine or Quarry
	Miscellaneous Water
	Perennial Water
	Rock Outcrop
	Saline Spot
	Sandy Spot
	Severely Eroded Spot
	Sinkhole
	Slide or Slip
	Sodic Spot
Water Features	
	Streams and Canals
Transportation	
	Rails
	Interstate Highways
	US Routes
	Major Roads
	Local Roads
Background	
	Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 12, Feb 26, 2010

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

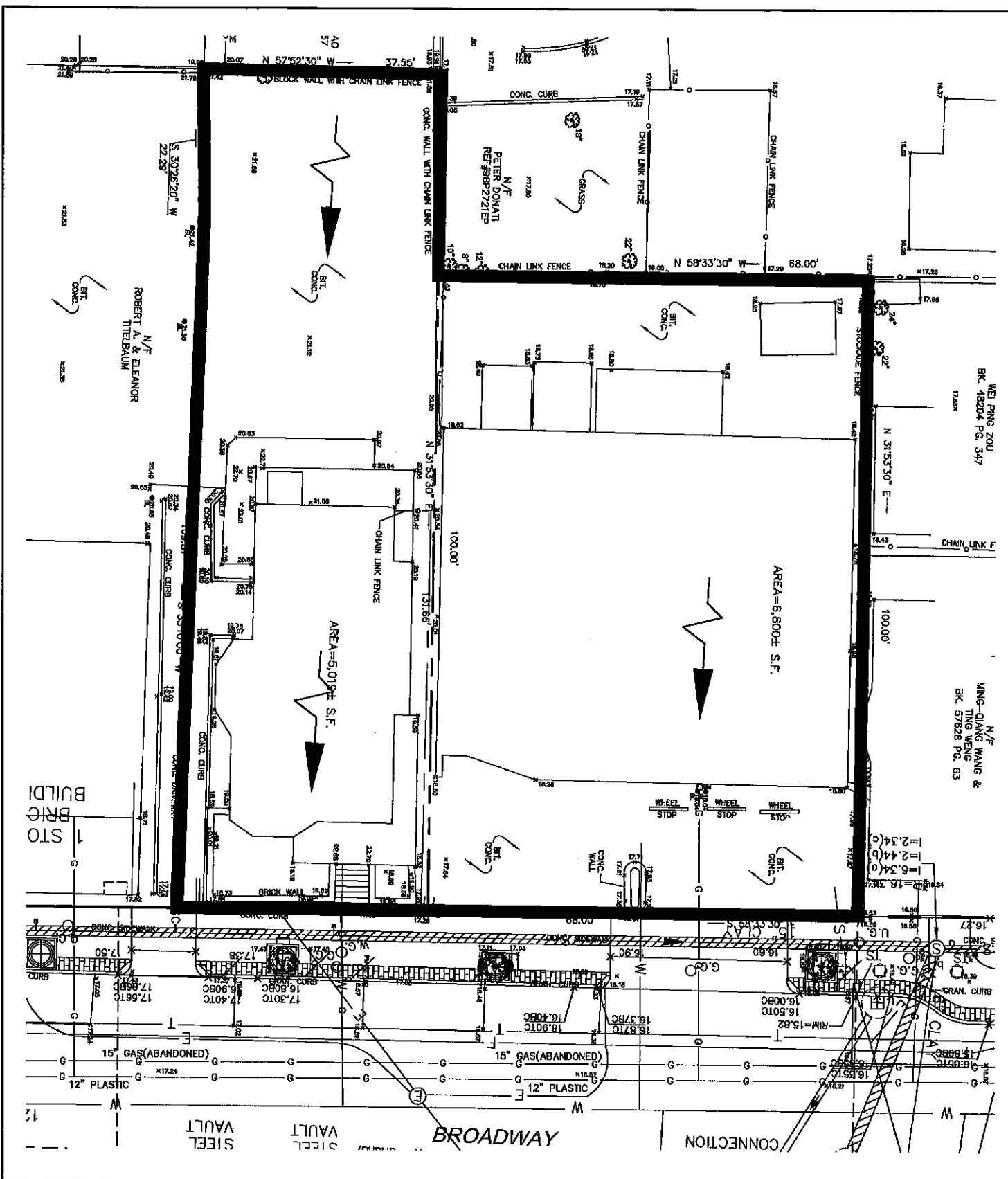
Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	Map Unit Name	Acres In AOI	Percent of AOI
603	Urban land, wet substratum	0.2	100.0%
Totals for Area of Interest		0.2	100.0%

Appendix C



Design Consultants, Inc.

Consulting Engineers and Surveyors

120 MIDDLESEX AVENUE
SOMERVILLE, MA 02145
617-776-3350

176 & 182 BROADWAY
SOMERVILLE, MA

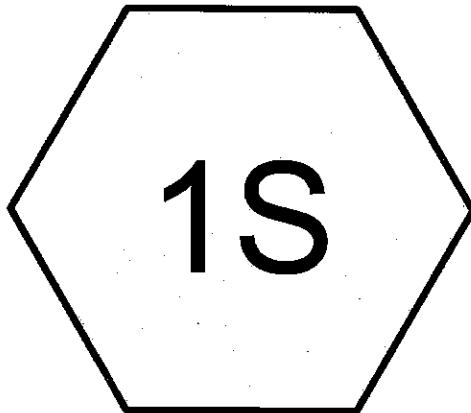
FIGURE 1
EXISTING
CATCHMENT
AREAS

SCALE: 1" = 20'

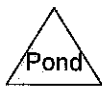
2012-125

Appendix D

Appendix E



Existing



Drainage Diagram for 2012-125 EX
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Time span=0.00-30.00 hrs, dt=0.30 hrs, 101 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing

Runoff Area=11,819 sf 100.00% Impervious Runoff Depth=2.87"

Tc=6.0 min CN=98 Runoff=0.54 cfs 2,825 cf

Total Runoff Area = 11,819 sf Runoff Volume = 2,825 cf Average Runoff Depth = 2.87"
0.00% Pervious = 0 sf 100.00% Impervious = 11,819 sf

2012-125 EX

Type III 24-hr 2-Year Rainfall=3.10"

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Page 3

Summary for Subcatchment 1S: Existing

Runoff = 0.54 cfs @ 12.05 hrs, Volume= 2,825 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.30 hrs

Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
11,819	98	Paved parking, HSG C
11,819		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Time span=0.00-30.00 hrs, dt=0.30 hrs, 101 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing

Runoff Area=11,819 sf 100.00% Impervious Runoff Depth=4.26"

Tc=6.0 min CN=98 Runoff=0.80 cfs 4,200 cf

Total Runoff Area = 11,819 sf Runoff Volume = 4,200 cf Average Runoff Depth = 4.26"
0.00% Pervious = 0 sf 100.00% Impervious = 11,819 sf

Time span=0.00-30.00 hrs, dt=0.30 hrs, 101 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing

Runoff Area=11,819 sf 100.00% Impervious Runoff Depth=5.06"

Tc=6.0 min CN=98 Runoff=0.94 cfs 4,986 cf

Total Runoff Area = 11,819 sf Runoff Volume = 4,986 cf Average Runoff Depth = 5.06"
0.00% Pervious = 0 sf 100.00% Impervious = 11,819 sf

Time span=0.00-30.00 hrs, dt=0.30 hrs, 101 points

Runoff by SCS TR-20 method, UH=SCS

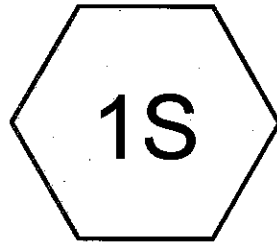
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing

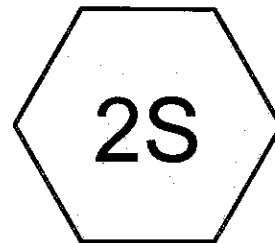
Runoff Area=11,819 sf 100.00% Impervious Runoff Depth=6.26"

Tc=6.0 min CN=98 Runoff=1.15 cfs 6,167 cf

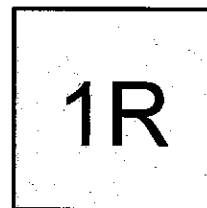
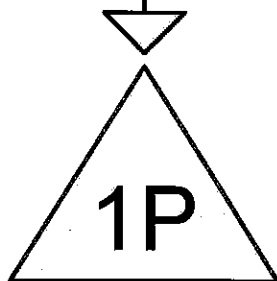
Total Runoff Area = 11,819 sf Runoff Volume = 6,167 cf Average Runoff Depth = 6.26"
0.00% Pervious = 0 sf 100.00% Impervious = 11,819 sf



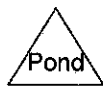
Roof



Undetained Runoff



Detention



2012-125 Proposed

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Proposed
Type III 24-hr 2-Year Rainfall=3.10"

Printed 1/27/2014

Page 2

Summary for Subcatchment 1S: Roof

Runoff = 0.35 cfs @ 12.05 hrs, Volume= 1,797 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.30 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
7,518	98	Roofs, HSG C
7,518		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment 2S: Undetained Runoff

Runoff = 0.11 cfs @ 12.08 hrs, Volume= 549 cf, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.30 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
1,115	98	Paved parking, HSG C
957	98	Paved parking, HSG C
2,238	69	50-75% Grass cover, Fair, HSG B
4,310	83	Weighted Average
2,238		51.93% Pervious Area
2,072		48.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Reach 1R:Inflow Area = 11,828 sf, 81.08% Impervious, Inflow Depth = 1.92" for 2-Year event
Inflow = 0.43 cfs @ 12.09 hrs, Volume= 1,889 cf
Outflow = 0.43 cfs @ 12.09 hrs, Volume= 1,889 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.30 hrs

Summary for Pond 1P: DetentionInflow Area = 7,518 sf, 100.00% Impervious, Inflow Depth = 2.87" for 2-Year event
Inflow = 0.35 cfs @ 12.05 hrs, Volume= 1,797 cf
Outflow = 0.32 cfs @ 12.10 hrs, Volume= 1,476 cf, Atten= 9%, Lag= 3.0 min
Discarded = 0.00 cfs @ 3.00 hrs, Volume= 136 cf
Primary = 0.31 cfs @ 12.10 hrs, Volume= 1,340 cf

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Proposed
Type III 24-hr 2-Year Rainfall=3.10"

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Page 3

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.30 hrs
 Peak Elev= 17.54' @ 12.10 hrs Surf.Area= 347 sf Storage= 394 cf

Plug-Flow detention time= 144.0 min calculated for 1,476 cf (82% of inflow)
 Center-of-Mass det. time= 72.2 min (829.1 - 756.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.46'	253 cf	14.83'W x 23.36'L x 2.33'H Field A 809 cf Overall - 177 cf Embedded = 632 cf x 40.0% Voids
#2A	15.96'	177 cf	StormTech SC-310 x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap
		430 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.46'	0.170 in/hr Exfiltration over Surface area
#2	Primary	17.20'	8.0" Round Outlet L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 17.20' / 16.90' S= 0.0100 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.00 cfs @ 3.00 hrs HW=15.48' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.00 cfs).

Primary OutFlow Max=0.29 cfs @ 12.10 hrs HW=17.52' (Free Discharge)
 ↳ **2=Outlet** (Barrel Controls 0.29 cfs @ 2.57 fps)

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Proposed
Type III 24-hr 2-Year Rainfall=3.10"

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Page 1

Time span=0.00-30.00 hrs, dt=0.30 hrs, 101 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Roof

Runoff Area=7,518 sf 100.00% Impervious Runoff Depth=2.87"

Tc=6.0 min CN=98 Runoff=0.35 cfs 1,797 cf

Subcatchment 2S: Undetained Runoff

Runoff Area=4,310 sf 48.07% Impervious Runoff Depth=1.53"

Tc=6.0 min CN=83 Runoff=0.11 cfs 549 cf

Reach 1R:

Inflow=0.43 cfs 1,889 cf

Outflow=0.43 cfs 1,889 cf

Pond 1P: Detention

Peak Elev=17.54' Storage=394 cf Inflow=0.35 cfs 1,797 cf

Discarded=0.00 cfs 136 cf Primary=0.31 cfs 1,340 cf Outflow=0.32 cfs 1,476 cf

Total Runoff Area = 11,828 sf Runoff Volume = 2,345 cf Average Runoff Depth = 2.38"
18.92% Pervious = 2,238 sf 81.08% Impervious = 9,590 sf

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Proposed
Type III 24-hr 10-Year Rainfall=4.50"

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Page 2

Time span=0.00-30.00 hrs, dt=0.30 hrs, 101 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Roof

Runoff Area=7,518 sf 100.00% Impervious Runoff Depth=4.26"

Tc=6.0 min CN=98 Runoff=0.51 cfs 2,671 cf

Subcatchment 2S: Undetained Runoff

Runoff Area=4,310 sf 48.07% Impervious Runoff Depth=2.73"

Tc=6.0 min CN=83 Runoff=0.20 cfs 979 cf

Reach 1R:

Inflow=0.68 cfs 3,190 cf

Outflow=0.68 cfs 3,190 cf

Pond 1P: Detention

Peak Elev=17.63' Storage=407 cf Inflow=0.51 cfs 2,671 cf

Discarded=0.00 cfs 140 cf Primary=0.48 cfs 2,211 cf Outflow=0.48 cfs 2,351 cf

Total Runoff Area = 11,828 sf Runoff Volume = 3,650 cf Average Runoff Depth = 3.70"**18.92% Pervious = 2,238 sf 81.08% Impervious = 9,590 sf**

2012-125 Proposed

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Proposed
Type III 24-hr 25-Year Rainfall=5.30"

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Page 3

Time span=0.00-30.00 hrs, dt=0.30 hrs, 101 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Roof

Runoff Area=7,518 sf 100.00% Impervious Runoff Depth=5.06"

Tc=6.0 min CN=98 Runoff=0.60 cfs 3,172 cf

Subcatchment 2S: Undetained Runoff

Runoff Area=4,310 sf 48.07% Impervious Runoff Depth=3.45"

Tc=6.0 min CN=83 Runoff=0.26 cfs 1,238 cf

Reach 1R:

Inflow=0.82 cfs 3,948 cf

Outflow=0.82 cfs 3,948 cf

Pond 1P: Detention

Peak Elev=17.68' Storage=413 cf Inflow=0.60 cfs 3,172 cf

Discarded=0.00 cfs 141 cf Primary=0.57 cfs 2,710 cf Outflow=0.57 cfs 2,851 cf

Total Runoff Area = 11,828 sf Runoff Volume = 4,410 cf Average Runoff Depth = 4.47"**18.92% Pervious = 2,238 sf 81.08% Impervious = 9,590 sf**

2012-125 Proposed

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Proposed
Type III 24-hr 100-Year Rainfall=6.50"

Printed 1/27/2014

Page 4

Time span=0.00-30.00 hrs, dt=0.30 hrs, 101 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Roof

Runoff Area=7,518 sf 100.00% Impervious Runoff Depth=6.26"

Tc=6.0 min CN=98 Runoff=0.73 cfs 3,923 cf

Subcatchment2S: Undetained Runoff

Runoff Area=4,310 sf 48.07% Impervious Runoff Depth=4.56"

Tc=6.0 min CN=83 Runoff=0.34 cfs 1,637 cf

Reach 1R:

Inflow=1.04 cfs 5,096 cf

Outflow=1.04 cfs 5,096 cf

Pond 1P: Detention

Peak Elev=17.75' Storage=423 cf Inflow=0.73 cfs 3,923 cf

Discarded=0.00 cfs 143 cf Primary=0.70 cfs 3,459 cf Outflow=0.70 cfs 3,602 cf

Total Runoff Area = 11,828 sf Runoff Volume = 5,560 cf Average Runoff Depth = 5.64"**18.92% Pervious = 2,238 sf 81.08% Impervious = 9,590 sf**

Appendix F

SEWER CALCULATIONS

I. INTRODUCTION

The following sewerage calculations are based upon 310 CMR 15.203, 314 CMR 7.15 and architectural floor plans provided by Khalsa Design, Inc.

II. CALCULATIONS

Number of Bedrooms	38
Average Daily Flow (110 gal/day/bedroom)	4,180 gal/day
Bakery – square feet (300gpd/1,000sf)	405 gal/day
Total	4,585 gal/day
Peaking Factor	5.5
Total Peak Flow	17.5 gal/min
Slope	0.020
Pipe Size	6"

III. DESIGN

PVC pipe (Manning's roughness coefficient = 0.011) at the calculated slope and diameter is adequate for flows of 385 gal/min and less (see attached nomograph). The proposed design falls within acceptable limits.

IV. CONCLUSION

Six-inch (6") PVC, SDR 35, ASTM D3034 is proposed for the sewer line.

Appendix G

INFILTRATION/INFLOW REMOVAL CALCULATIONS

I. INTRODUCTION

The following infiltration/inflow removal calculations are based upon 310 CMR 15.203, the sewer calculations presented above, and the storm drainage calculations summarized in Table I. The City of Somerville requires that infiltration/inflow removal of four times the proposed additional average daily sewer flow must be provided by the project.

II. CALCULATIONS

Existing Average Daily Sewer Flow	$4 \times 110\text{gpd/bed} = 440\text{gpd}$ $3,711\text{sf} \times 300\text{gpd}/1000\text{sf} = 1,113\text{gpd}$ Total = 1,553 gpd
Proposed Average Daily Sewer Flow	$38 \times 110\text{gpd/bed} = 4,180\text{gpd}$ $1,350\text{sf} \times 300\text{gpd}/1000\text{sf} = 405\text{gpd}$ Total = 4,585
Additional Average Daily Flow	3,032gpd
Four Times Additional Average Daily Flow	12,128gpd = 0.02cfs

III. REMOVAL

The required 0.02 cfs of infiltration/ inflow will be removed from the combined sewer system by peak flow reduction in the storm drainage from the site. Subtraction of the proposed flow rates from the existing flow rates given in Table 1 indicates flow reductions of 0.11 cfs, 0.12 cfs, 0.12 cfs, and 0.11 cfs for the 2 yr., 10yr., 25 yr., and 100 yr. Storms respectively. All of these flow reductions exceed the required removal of 0.02 cfs.

IV. CONCLUSION

Because the storm drainage flow reductions provided by the project exceed the required infiltration/inflow removal rate we conclude that the proposed design meets and exceeds the requirement for infiltration/inflow removal.

Appendix H

DOMESTIC WATER DEMAND CALCULATIONS AND PIPE SIZING

LOCATION:	182 Broadway, Somerville	Design Consultants, Inc.
DESCRIPTION OF FACILITY:	Mixed Use - 19 Units Res. + Bakery	Calc by: RLB
Architectural Reference Plans:	Khalsa Floor Plans, 5-8-13	Date: 7/29/2013

UNITS	DESCRIPTION	DCI Job#: 2012-125	FACTOR	HOT	COLD
34	BATHTUBS (W/WO SHOWERHEAD)		2	68	68
3	SHOWER STALLS (SINGLE HEAD)		2	6	6
19	DISHWASHER (DOMESTIC)		2	38	38
19	KITCHEN SINKS (RESIDENTIAL)		2	38	38
2	KITCHEN SINKS (COMMERCIAL)		6	12	12
60	LAVATORIES		1	60	60
19	WASHING MACHINE/LAUNDRY TRAY		2	0	38
0	URINALS (FLUSH VALVE TYPE)		6	N/A	0
41	WATER CLOSETS (TANK TYPE)		1	N/A	41
0	WATER CLOSETS (FLUSH VALVE TYPE)		12	N/A	0
2	HOSE FAUCET/SILL COCK/HOSE BIBBS		2	N/A	4
0	OTHER		0	0	0

adding HOT & COLD values yields... FIXTURE UNITS: 527 = 222 + 305

SELECT PROPER DEMAND FACTOR FROM TBL 2 (SEE BELOW) 0.35

MULTIPLY TOTAL x DEMAND FACTOR (FROM TABLE 2) 527 x 0.35 = 184.5

A CAPACITY VALUE OF 184.5 WOULD REQUIRE A WATER SERVICE SIZE OF

(SEE TABLE 3 BELOW)

TABLE 2			TABLE 3	
OCCUPANCY USE	DEMAND FACTOR	SERVICE PIPE SIZE	CAPACITY VALUE	
RES. 1 OR 2 FAMILY	0.50	3/4 "	NOT RECOMMENDED	
MULTI-RESIDENTIAL	0.35	1 "	9.1 TO	16.5
HOTEL	0.70	1 1/2 "	16.6 TO	55.0
BUS. GENERAL	0.25	2 "	55.1 TO	107.499
RESTAURANT/CAFÉ	0.70	4 "	107.5 TO	700

Note: Calculations based upon Mass. Plumbing Codes (248 CMR 10.14)

Note: Calculations are preliminary, to be confirmed by Registered MEP Engineer.